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MODERN PHYSIOLOGY FROM THE
CHEMICAL STANDPOINT.

Text-book of Physiology. Edited by E. A. Schäfer, LL.D., F.R.S. Vol. i. (Edinburgh and London: Young J. Pentland, 1898.)

UNDOUBTEDLY, as the editor remarks in his preface to the above work, there has been a great desire on the part of teachers of physiology in this country to obtain a complete text-book on their subject, written in English, somewhat similar to the classical *Handbuch* of Hermann. Prof. Schäfer, with the aid of some of the best-known physiologists in Britain at the present day, has succeeded in bringing out a work which, if one may judge from the first volume, is destined to supply more or less completely the want that has been so long felt. It is a text-book essentially intended for advanced students; and although all the parts are not treated with like fulness, still the fact remains undoubted that at present no text-book in English is so complete as this one. The first volume deals practically entirely with the subject from the chemical standpoint. The first two chapters, by Halliburton, on the chemical constituents of the body and food, and on the chemistry of the tissues and organs respectively, are praiseworthy in so far as they give a fairly full account of the subjects with which they deal. But, seeing that these chapters must contain from their very nature many of the points to be discussed afterwards under special chapters, it would have been better, perhaps, had they been slightly shorter and more interestingly written. Then, again, a number of errors have crept in that ought not to have appeared. For example, the statement that the sugars are designated according to the number of carbon atoms they contain is hardly correct, as one may see by taking one of the examples given in the book. Rhamnose, although it contains six carbon atoms, is not a hexose but a pentose, viz. a methyl-pentose $\text{CH}_3(\text{CHOH})_4\text{COH}$. They are designated not by the number of carbon atoms they contain, but by the number of oxygen atoms they possess. Here and there careless methods of expression are used, especially in the case of the sugars. Levulose is a ketone of sorbite as well as mannite. The note at the foot of p. 6 is slightly vague in meaning. Of course, as the writer says, the letters *d*, *l*, *z* do not refer to the rotatory power of the sugars, but to their genetic relationship to a fixed aldo-hexose. The letters only agree with the rotatory power in the case of the natural aldo-hexoses. Small points here and there are vaguely expressed. There is absolutely no doubt that vitellin is not a globulin, but a nucleo-albumin. The statement that Kossel has described four nucleic acids corresponding to four separate nuclein bases is hardly correct. He merely surmised that there might be a nucleic acid furnishing on decomposition a single definite alloxur base, and he based this supposition upon his investigation of the nucleic acid obtained from the nuclein of the thymus gland, which he at first termed adenylic acid because he imagined that adenin only was obtained from its decomposition. This, of course, has been shown by Kossel

himself to be incorrect. Up to the present no such nucleic acids have been prepared. Again, it is more than doubtful whether any genetic relationship exists between hæmatogen and hæmoglobin, as Bunge thought. The way in which the iron is bound in the former is absolutely different from that in the case of the latter. Again, there are points of the greatest interest that might have been put in a more interesting fashion; for example, the extremely important relationship between chitin and chondrin. The classification of the proteids which is given is not a particularly good one. There are too many repetitions, and the divisions into which the author has classed the different members are so scattered that it is difficult to grasp the subject at all well. There are many other points that would have been the better for a little fuller description, e.g. carnin acid (Siegfried) and the paired acids of glycuronic acid.

These articles have entailed undoubtedly a great deal of labour, and contain much that is interesting and difficult elsewhere to obtain, but they are hardly intended for students.

The part dealing with hæmoglobin and the principal products of its decomposition, by Gamgee, is exceedingly well written. It suffers, however, from its more or less one-sided character. Some of the more recent work—as, for example, the acids obtained from hæmatin—by Küster has been wholly disregarded. Through it all, however, the reader can easily perceive that it is a subject with which the writer is familiar.

The section on the blood, by Schäfer, is very well written.

The effect of acids on the reaction of the blood of herbivora might have been more clearly explained.

The proteids of the tissues in herbivora do not break down to furnish ammonia to neutralise the acid introduced, and hence the alkali of the blood is taken up with the result that mineral acids act as poisons in such a case.

The equation given on p. 157, showing the action of disodic phosphate in the transmission of CO_2 in the blood, is incorrect. It ought to be



Some reference might have been made to the important work done before Hürthle on the cholesterin esters in the blood; and it would also have been better if Nasse's work contradicting that done by Lépine on the absence of the glycolytic action of the blood in diabetes had been mentioned, as it is so important.

The recent work of Hammarsten on the coagulation of the blood might have been more fully referred to, as it was so carefully done, and the results obtained were so important. Many of the important points in Hammarsten's paper are referred to, but the source is not always acknowledged.

Diffusion, osmosis and filtration are treated of by Waymouth Reid in a very interesting chapter. This subject has been so much worked at in Germany within recent years, that the author would have no difficulty in gathering together and weaving into an interesting whole a number of facts scattered through the *Zeitschrift für physikalische Chemie* and Pfeffer's new text-book.

The chapter on the production and absorption of

lymph, by Starling, is short but good, and gives a succinct account of our present-day knowledge of this very interesting subject.

The next chapter, by Moore, on the chemistry of the digestive processes, must have entailed a large amount of labour, as the literature is overwhelming. It might have benefited by curtailment, and by the omission of such words as "flocky," "unsolvable," and some others. The mass of unproved details with which Kühne deluged physiology has been largely made use of. Those who wish to be able to criticise this work of Kühne might with advantage look up the original papers by Kühne and Chittenden and Neumeister. They will then perceive that a number of bodies there referred to depend for their separate and definite existence upon very insufficient data. The physiological chemist of a later date will smile when he reads of anti-albumid, anti-albumate, anti-albumose, and so on. A lot of details given in this paper might have been, perhaps, with advantage omitted, as after all they are only of use to those working at the subject, and later on will be merely of historical interest. Pajkull's work on the mucin of bile requires to be repeated. It is by no means certain that the mucin is a nucleo-proteid. This chapter, however, gives as good an account of the subject as any one could desire. It has been kept well up to date, including as it does such recent work as that of Nuttall and Thierfelder.

The chapter, by Langley, on the salivary glands is an excellent one, distinguished alike by its clearness and suggestiveness as well as its succinctness.

The mechanism of the secretion of gastric, pancreatic, and intestinal juices is discussed in an interesting way by Edkins, as is also the section on the secretion of bile, by Noël Paton.

The important chapter on the chemistry of the urine has been entrusted to Hopkins, who has succeeded, in the space at his disposal, in giving a most excellent account of the subject. Here, of course, an author must exercise the gift of selection, as, in order to be complete, one would require to give another Huppert and Thomas' Handbuch. It ought to have been noted that the Krüger and Wulff method for estimation of the nuclein bases and uric acid is not a trustworthy one, as other nitrogen-holding bodies are precipitated. The inorganic constituents of the urine have received but scant attention.

The chapters on the secretion of urine and on that of milk, by Starling and Schäfer respectively, are clearly written; as is also that on the secretion and absorption of the skin, by Waymouth Reid.

The chapter on the chemistry of respiration, by Pembrey, is a good one; as are also those on animal heat, by the same author, and on metabolism, by Schäfer.

It is a pity that in such a book as this there is not only a necessary repetition, but also a tendency to omission of certain facts because they fall under two headings. An example of this may be given. The relationship between leucocytosis and the excretion of uric acid and nuclein bases is referred to in the section dealing with the chemistry of the urine, and also in that on metabolism. The result has been that in neither is there a proper description of Horbaczewski's experiments, nor are the conclusions which Horbaczewski arrived at clearly defined.

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The work of Sandmeyer, on the effect of giving pancreas by the stomach to dogs that have had their pancreas removed, has not been referred to. This volume closes with an exceedingly interesting account of the internal secretions of the ductless glands and their effects upon metabolism. As one would expect from the writer of this article, the supra-renal extracts have received a good deal of attention, a little of which might have been bestowed on the thyroid therapy.

The points which have been drawn attention to in this review as perhaps admitting of improvement are few in number. The book stands as a monument of industry care and thought on the part of the editor and his coadjutors. It is, without doubt, the best book that we at present possess in English on the subjects dealt with in the first volume of what will prove to be a text-book of the greatest advantage to all interested in the subject of physiology. Before the value of such a book can be accurately appraised, it must be read carefully and intelligently, and compared with the original papers from which all such books must be built up. Those working at a special department of the subject may think that there might have been some additions or omissions; but one must remember that the subject is such a huge one, and the mass of literature to be consulted so immense, that after all such a complete text-book for the scientific worker must always remain mainly as a stepping-stone between the ordinary smaller text-book and the original papers. It is the conscientious perusal of the latter that must always remain, if the slowest, still the surest way to gain a knowledge of that most fascinating subject, physiology.

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VEGETABLE ORGANOGRAPHY.

Organographie der Pflanzen. By Dr. K. Goebel. Part i. With 130 figures in the text. Pp. ix + 232. (Jena: Gustav Fischer, 1898.)

IT is difficult to realise that this book is the work of the same author who wrote the now classical text-book of morphology. Later publications of Dr. Goebel's have been largely occupied with biological subjects, and he appears in the book before us to have abandoned the morphologist's standpoint, and assumed a physiological or, perhaps more correctly, a biological position. In making this change he admits that phyllogenetic speculations are, without doubt, more attractive than the investigation of the illusive causes, external or internal, which determine modifications of form; yet for him the recognition of the factors which bring about the unsymmetrical form of a leaf is of more importance than the construction of insubstantial theories of phyllogenetic development.

In the introduction the author further insists on the insufficiency of morphology, and quotes from Herbert Spencer to emphasise the fact that function and form are mutually interdependent. In the strict study of morphology the functions have been treated as something extraneous, and as having nothing at all to do with the characteristics of the organs.

The latter part of the introduction is devoted to a discussion of the two rival hypotheses as to the formation of the organs of plants, *e.g.* the theory of the